

QUALCON / APQO 2021  
THE FUTURE OF QUALITY IS NOW!

Quality in the balance?  
Competing in the age of  
black swans and grey  
rhinos

Nigel Grigg





What topics do I now include in a QM course?

Why is Quality Management (and quality managers) becoming decoupled from process improvement?

What subjects are (in)appropriate for inclusion in a QM journal

Where does QM stop and operations or supply chain management start?

Are the quality gurus still relevant in the era of *Industrie 4.0* /Quality 4.0?



# Are quality and process improvement becoming decoupled?

## Continuous Improvement Advisor

**Manufacturing, Transport & Logistics** > Other

- Gain exposure to all aspects of our 3PL bus
- Excellent growth potential in a world-leading
- Be part of a high performing & fast-paced te

Are you looking for an exciting new step in yo  
championing continuous improvement? Look

## Continuous Improvement Analyst

time Transport

and influence outcomes

the NPDL group.

## Process Excellence Coach

**Banking & Financial Services** > Other

Process Excellence Coach Are you someone who is ready to ensure we deliver great customer experiences through process optimisation?

## Continuous Improvement Manager

**Manufacturing, Transport & Logistics** > Quality Assurance & Control

- Stunning West Coast Location
- 
- Drive Continuous Improvement Projects & Activities Across the Quality Team

Exciting & challenging role where confidence in the decisions you make & the ability to implement new business processes are the key for your success.

## Business Improvement Manager

4d ago

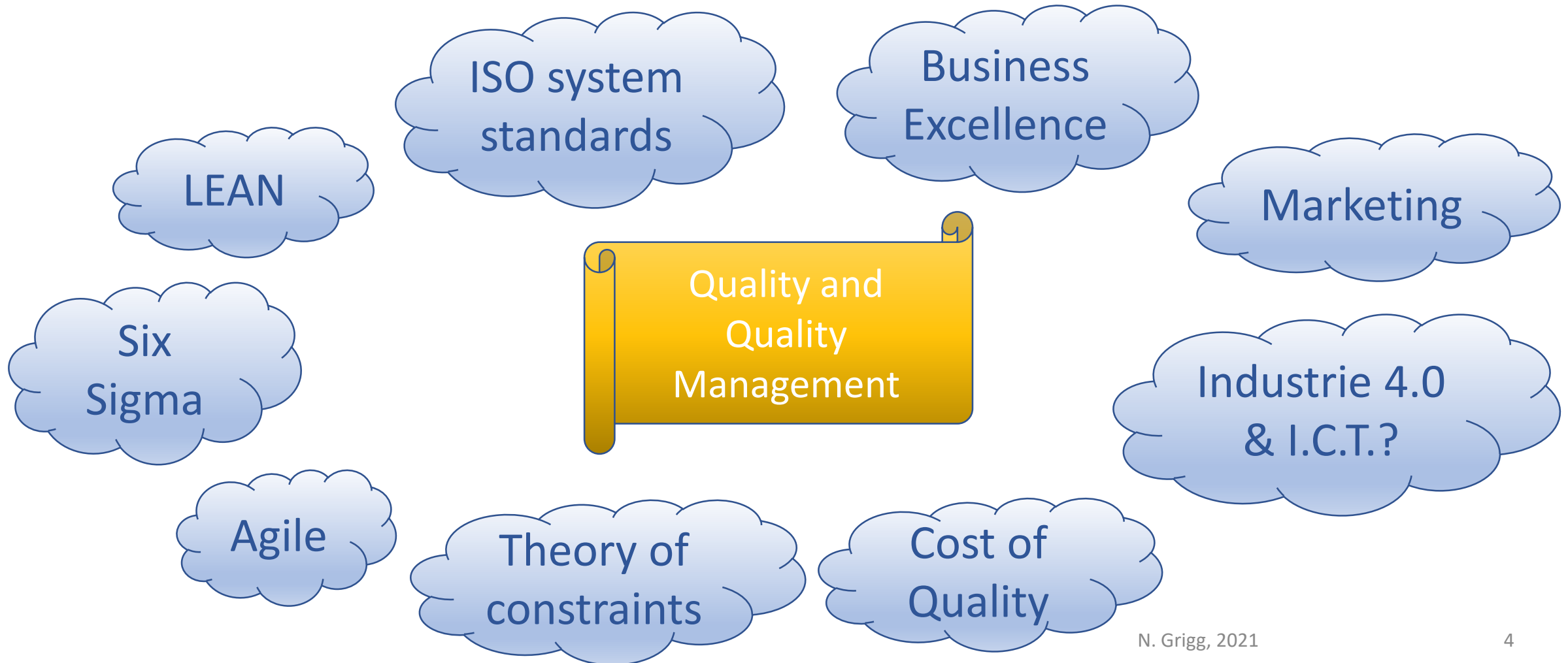
**Auckland** > Auckland Central

**Manufacturing, Transport & Logistics** > Rail & Maritime Transport

- Drive a continuous improvement culture
- Help deliver sustainable transport solutions to keep New Zealand moving!
- Wellington, Auckland or Hamilton based

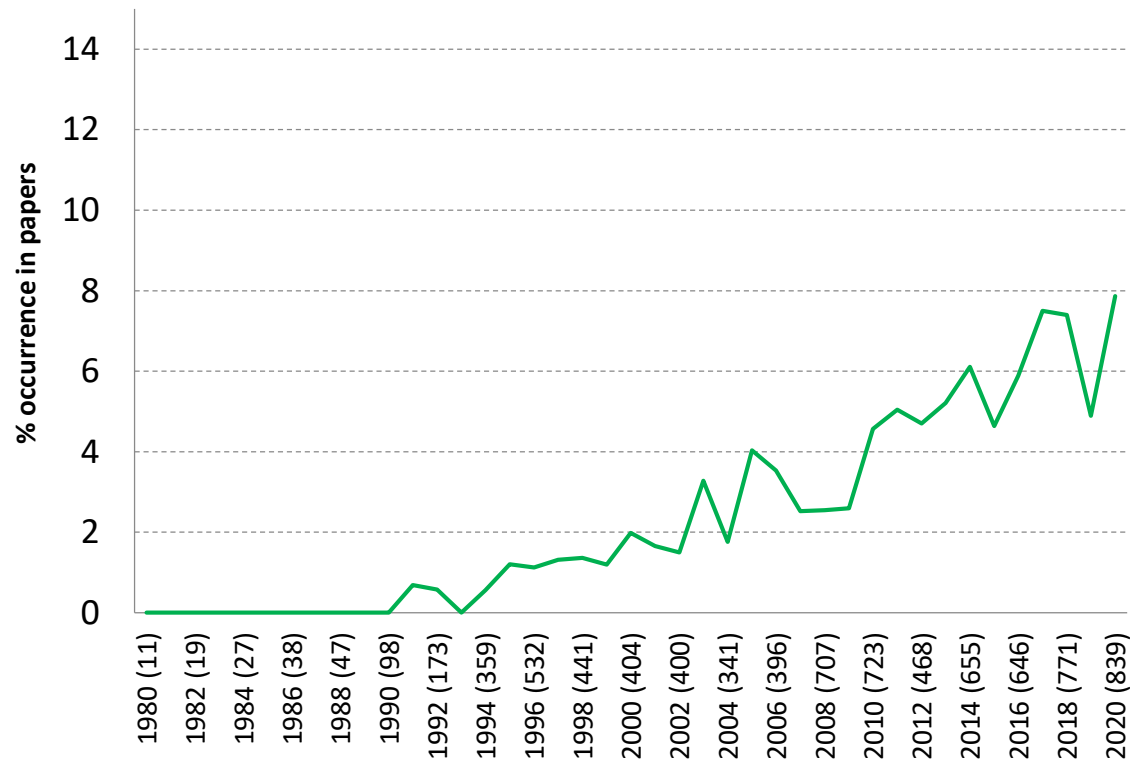
Bring your innovative thinking and change management expertise to create streamlined tools and processes for our Transport Property group.

# Where do methodologies and methods such as these fit into quality management?

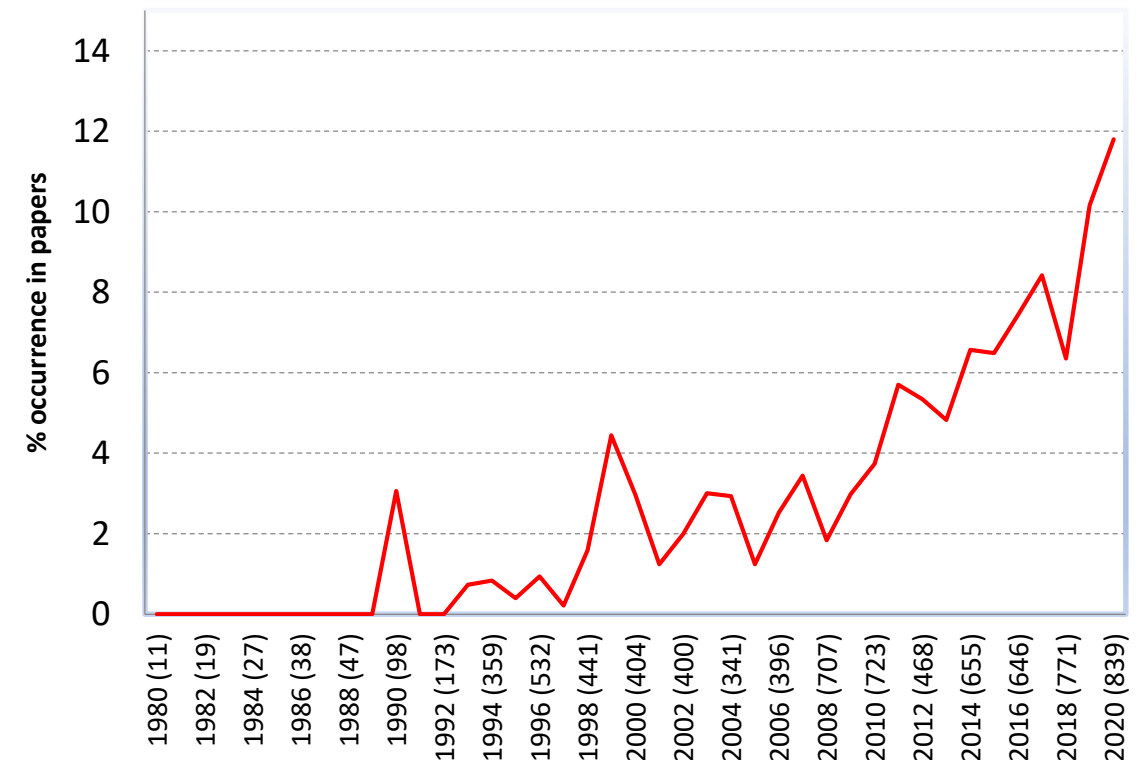


# What about these literature trends?

% of academic QM-related papers mentioning 'value' concepts



% of academic QM-related papers mentioning 'risk' concepts



Source: Scopus (Elsevier) database

N. Grigg, 2021

# Risk context: 'Black swan' event

*"...comes as a surprise, has a major effect, and is often inappropriately rationalized after the fact with the benefit of hindsight".*

- (Successful) acts of terrorism, piracy, cyber-attacks
- Volcanic eruptions, major earthquakes, tsunami events
- Stock market crashes
- Commercial Aircraft accidents / incidents
- Widespread food adulteration or contamination events
- Viral outbreaks and pandemics



Photo by N. Grigg



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# Risk context: 'Gray (*sic.*) Rhino'

- Highly probable, high impact but probably neglected;
- Not random, occur after warnings and visible evidence.
- How many of those examples listed on previous slide can be anticipated or planned for?
- So, when is an event a black swan, and when is it a grey rhino?
  - Climate change?
  - Pandemics?
  - Seismic events?



Photo by Dušan veverkolog on Unsplash

# So what's new?

- Unpredictable, high impact events are nothing new!
- What is new is the extent of impact these can have on trans-national interdependent supply chains.
  - Globalised supply networks
  - Distributed oversight and control
  - Reliance on I.T. systems
  - Many handover points
  - Many local cultures / contexts



Photo by N. Grigg



# What does this mean for quality?

- Has catapulted risk / risk management to the forefront of quality standards and models;
- We now know we need to be planning for the unplannable;
- And then there's Industry / Quality 4.0 to consider!
  - disruptive technology
  - cyber-physical systems
  - big data
  - hyper-connectivity



Photo by Stephen Dawson on Unsplash

# Value (V), Risk (R) and Cost (C) as core aspects of Quality (Q)

Are they...

...universal?

...different?

...complementary?

...in opposition?

...related to products/services, to production systems, or to customer decisions?



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# The QVRC model (2020)

The current issue and full text archive of this journal is available on Emerald Insight at:  
<https://www.emerald.com/insight/0265-671X.htm>

## QUALITY PAPER Redefining quality in terms of value, risk and cost: a literature review

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Redefining  
quality

Received 18 June 2020  
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### Abstract

**Purpose** – The purpose of this paper is to present a literature review demonstrating that quality and its management are increasingly definable as a balancing act between value, risk and cost throughout the value stream, from product/service design to production and delivery, and purchaser decision-making. An original framework is presented showing this interplay across the value stream, referred to as the QVRC framework. **Design/methodology/approach** – Content analysis is combined with bibliometric analytics, displayed via temporal graphs and citation networks. Reviewed literature is transdisciplinary, encompassing marketing, operations/quality and psychology sources. Core quality management methodologies are positioned on the framework illustrating their relative contribution to value, risk and cost management.

**Findings** – The QVRC framework is developed, and used as a basis for classifying models and methodologies associated with quality management. A set of propositions are developed, which, together with the framework, set an agenda for further research.

**Research limitations/implications** – No literature review can capture the richness of discourses on terms as pervasive as value, risk and cost. This paper aims to present a systematic and reliable sampling of such literature.

**Practical implications** – The resulting model can be applied to management tools, and to products and services.

**Originality/value** – Researchers, particularly in marketing, have developed models of value, risk and cost in terms of products and services. However, delivering products that provide the appropriate value, risk and cost trade-off is an operations management problem. This is the first paper to combine value, risk and cost across the value stream showing how this interplay extends beyond product.

**Keywords** Cost management, Literature review, Risk management, Value stream, Quality

**Paper type** Literature review

SHARE



## Introducing the QVRC model: Quality conceptualised as a balance between value, risk and cost



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Professor of Quality Systems,  
University.

Massey

### 1. INTRODUCTION

Risk and Value are terms that have been trending in quality literature over recent years. A recent review of literature spanning one hundred years of writings relating to quality revealed them (along with quality-related costs) to be themes that always underscored much of quality theory and practice. While references to the cost of quality have remained largely consistent over time, however, the concepts of value and risk have substantially increased in their occurrence over the 21st century.

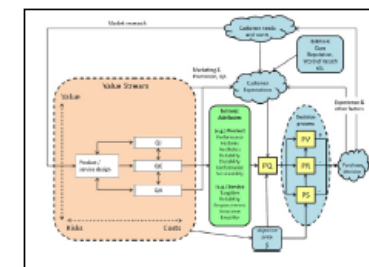
Considering value, Michael Porter first introduced the value chain concept in the mid-1980s [1]. A growth of interest in lean since the 1990s catapulted the term to greater prominence. Since then, the value concept has been widely discussed in reference to the value stream/flow, and the value chain has been reinvented to refer to the complete product life-cycle.

Considering risk, events such as: the 'Y2K' fears; the 2008 Global Financial Crisis; the 2012 European beef supply chain scandal and major product recalls; and now the global disruption created by COVID-19 lockdown have propelled risk to the very forefront of management concerns. However, risk is not new and has always been a primary concern of quality management (QM). Risk has been identified, reduced and managed through variation reduction, regulatory compliance, quality systems and procedures, and formalised tools such as FMEA (Failure Modes and Effects Analysis). Nevertheless, ISO 9001 and ISO 31000 have over recent years further explicitly emphasised the vital importance of adopting risk based thinking.

The third element (cost) has always been either implicit or explicit within early writing on the economics of quality by quality pioneers such as Shewhart, Dodge & Romig, Deming, Juran, Feigenbaum, Crosby and many others.

The literature analysis led to a re-conceptualisation of quality as a dynamic, tripartite balancing-act between creating and delivering customer value, while controlling and reducing risks, and managing costs across the entire value stream from design through to the purchase decision and beyond. This paper presents and describes the resulting model, referred to as the QVRC (Quality, Value, Risk and Cost) model. The paper will explain how to read the model, and its potential applications (value) for quality managers. The model is reproduced as figure 1

Figure 1: The QVRC Model (Grigg, N., 2020 [2])



Legend: QA = Quality Assurance, QC = Quality Control, QI = Quality Improvement, PQ = Perceived Quality, PV = Perceived Value, PR = Perceived Risk, PS = Perceived Sacrifice

### 2. THE PRODUCER SIDE (LHS) OF THE MODEL

Beginning on the producer (light orange, left hand) side, in designing a product or service the producer is aiming to create something that can be produced or delivered, and that a customer will want to pay for. The design process aims to



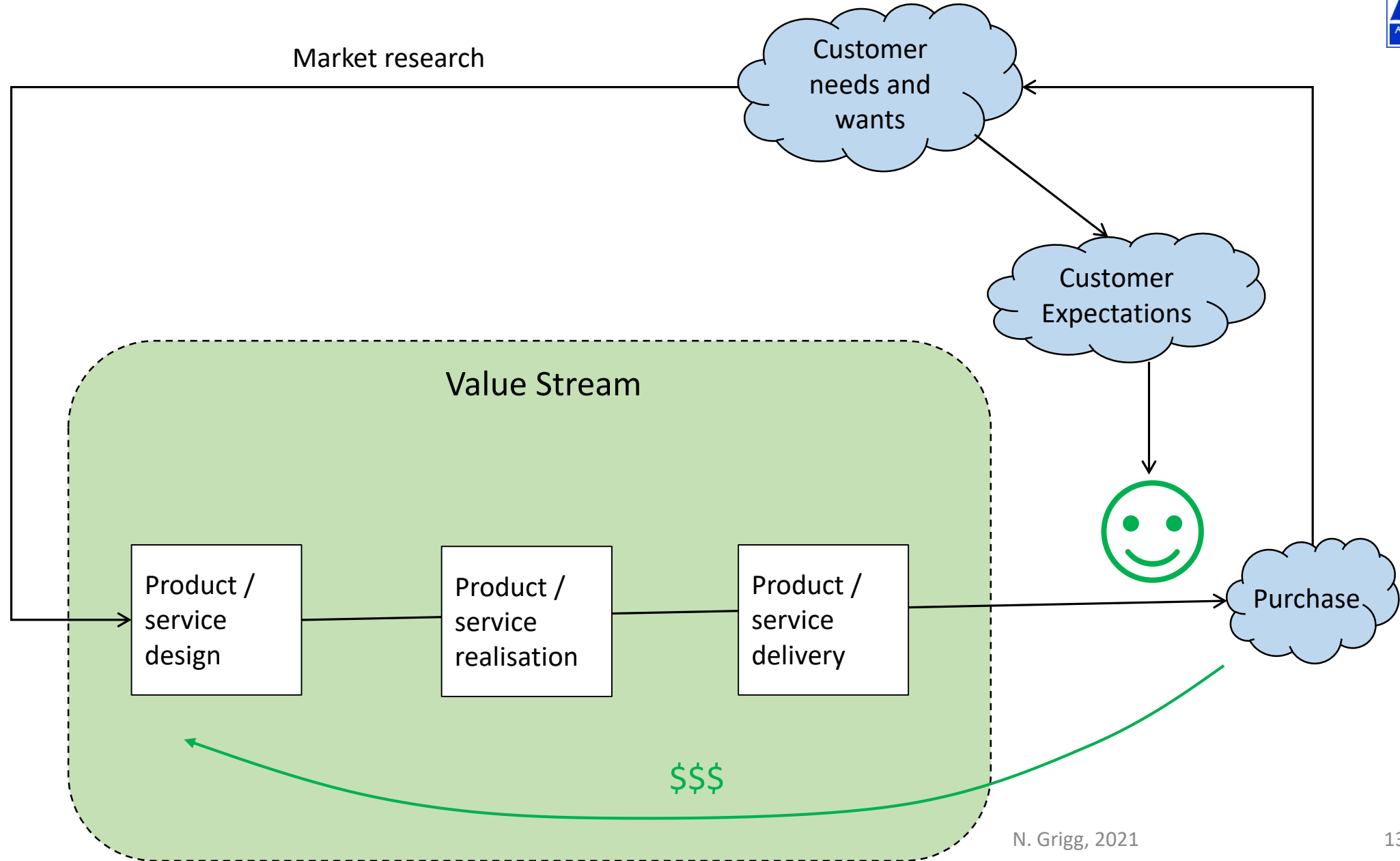
# Starting point: what *is* quality?

- Many formal definitions exist, all are good / relevant.
- Surely it is establishing what someone wants from you, and delivering it to them as, and when, they *expect* it.
  - i.e. right product, right place, right time, right quantity, right quality, right price;
- ‘Someone’ can be a customer, stakeholder, shareholder, patron, sponsor, funder...
- One or more of these entities supplies money that flows down the supply chain, financially sustaining the organisations (and people) that are part of it.



Photo by N. Grigg

# An initial model



# But people are individuals...

- So everyone's *perception* of your product or service is slightly different, as is their *expectation*.
- Prominent developers of quality and marketing theory have referred to this as 'perceived quality' (PQ)
- PQ is a concept that has been bundled-up with perceived value (PV), perceived risk (PR) and perceived 'sacrifice' (PS)



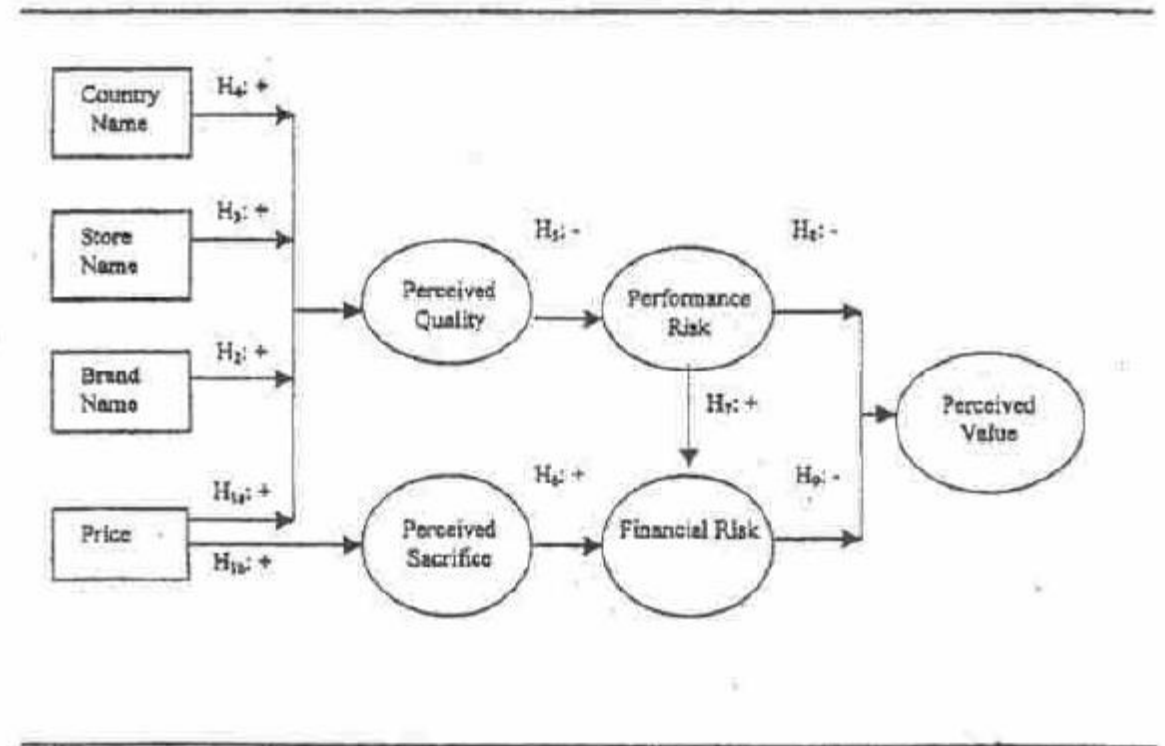
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# Perceived quality, value, risk and sacrifice

There are many models showing the relationship between perceived quality and perceived value, risk, sacrifice.

- **Perceived value** = the perceived utility or worth of a product or service
- **Perceived sacrifice** = what you must give up to buy or use the product or service (partly cost)
- **Perceived risk** = the potential risk associated with buying or using the product or service (partly cost)

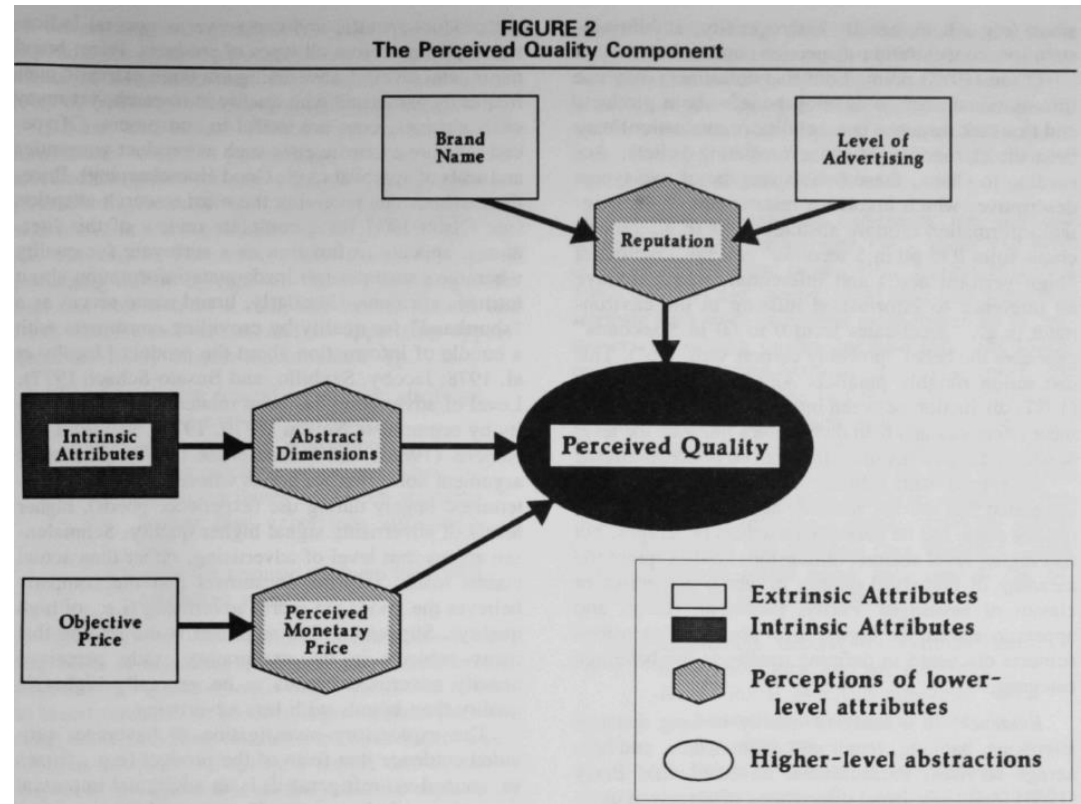


Agarwal & Teas, Journal of Marketing, 2001

# Perceived quality, value, risk and sacrifice

Here, Valarie Zeithaml presents some factors that feed into the perception of quality, these are:

- *Intrinsic* to the product or service
- *Extrinsic* – separate from the product or service
  - Price
  - Reputation (brand and advertising)

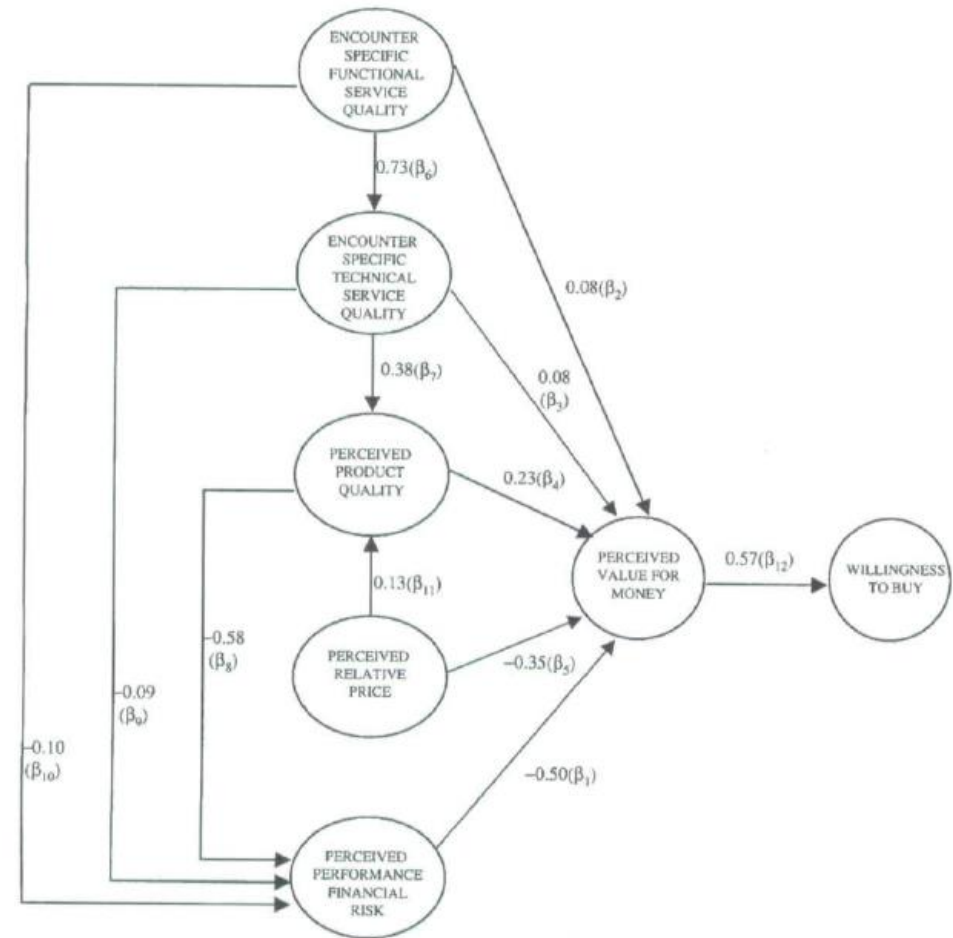


V. Zeithaml, Journal of Marketing, 1988

# Perceived quality, value, risk and sacrifice

In this model, 'willingness to buy' is a function of perceived value, which is a function of

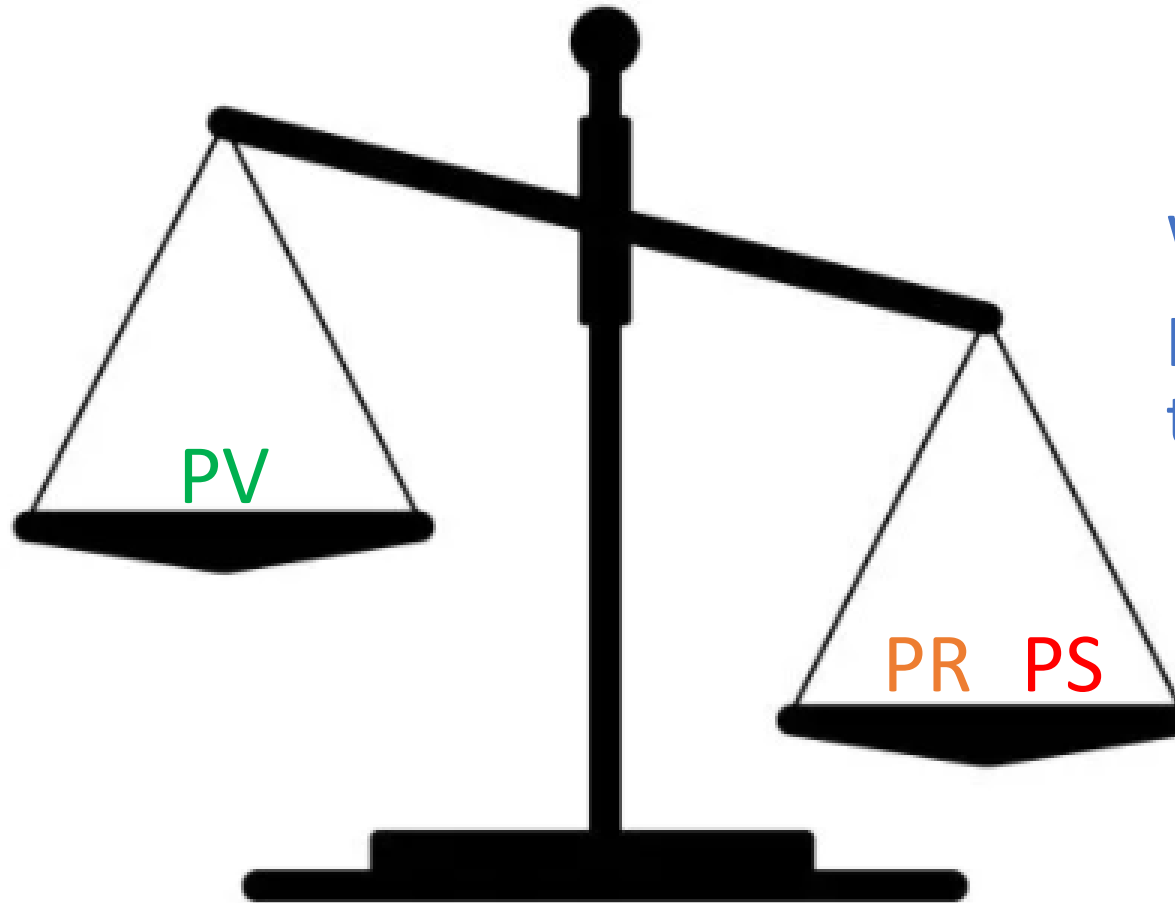
- Service quality;
- Perceived product quality;
- Relative price; and
- Perceived Risk.



Sweeney, Soutar and Johnson, Journal of Retailing, 1999



In simple terms...



Which way does a product or service tip the balance?

Some interesting examples...

# Fugu (Japanese puffer fish)

V, R, C	Nature	Relative Rating
Value	<ul style="list-style-type: none"> <li>A great delicacy</li> <li>Exclusive</li> <li>"Thrilling" (Elite Magazine)</li> </ul>	Medium-High
Risk	<ul style="list-style-type: none"> <li>...potentially fatal</li> </ul>	Medium
Cost	<ul style="list-style-type: none"> <li>3000 to several thousand yen</li> </ul>	High



Photo by Stelio Puccinelli on Unsplash



Photo by Y S on Unsplash

# Extreme adventure sports (e.g. climbing Mt. Everest)

V, R, C	Nature	Relative Rating
Value	<ul style="list-style-type: none"> <li>The ultimate self actualisation?</li> <li>An exclusive club</li> </ul>	High
Risk	<ul style="list-style-type: none"> <li>Dangerous, potentially fatal (the danger becomes part of the value)</li> </ul>	High
Cost	<ul style="list-style-type: none"> <li>&gt;\$50,000</li> </ul>	High



Photo by Mari Partyka on Unsplash



Photo by P. Childerhouse



# Cashmere (Pashm)

V, R, C	Nature	Relative Rating
Value	<ul style="list-style-type: none"> <li>The intrinsic value of cashmere lies in the fineness of the fibre (high value).</li> </ul>	High
Risk	<ul style="list-style-type: none"> <li>The risk with cashmere is that you may be getting some proportion of synthetic fibre.</li> <li>The value chain for cashmere is difficult to fully control (medium risk).</li> </ul>	Medium
Cost	<ul style="list-style-type: none"> <li>Labour intensity and geographical rarity makes it valuable (and expensive – high cost).</li> </ul>	High



Clip by N. Grigg

- Similar issues exist with products such as Mānuka honey that can be counterfeited.

# Addictive substances or habits

(Gambling, smoking, drug abuse, pornography, opioid medication dependency, alcohol, excess food, compulsive mobile device usage).

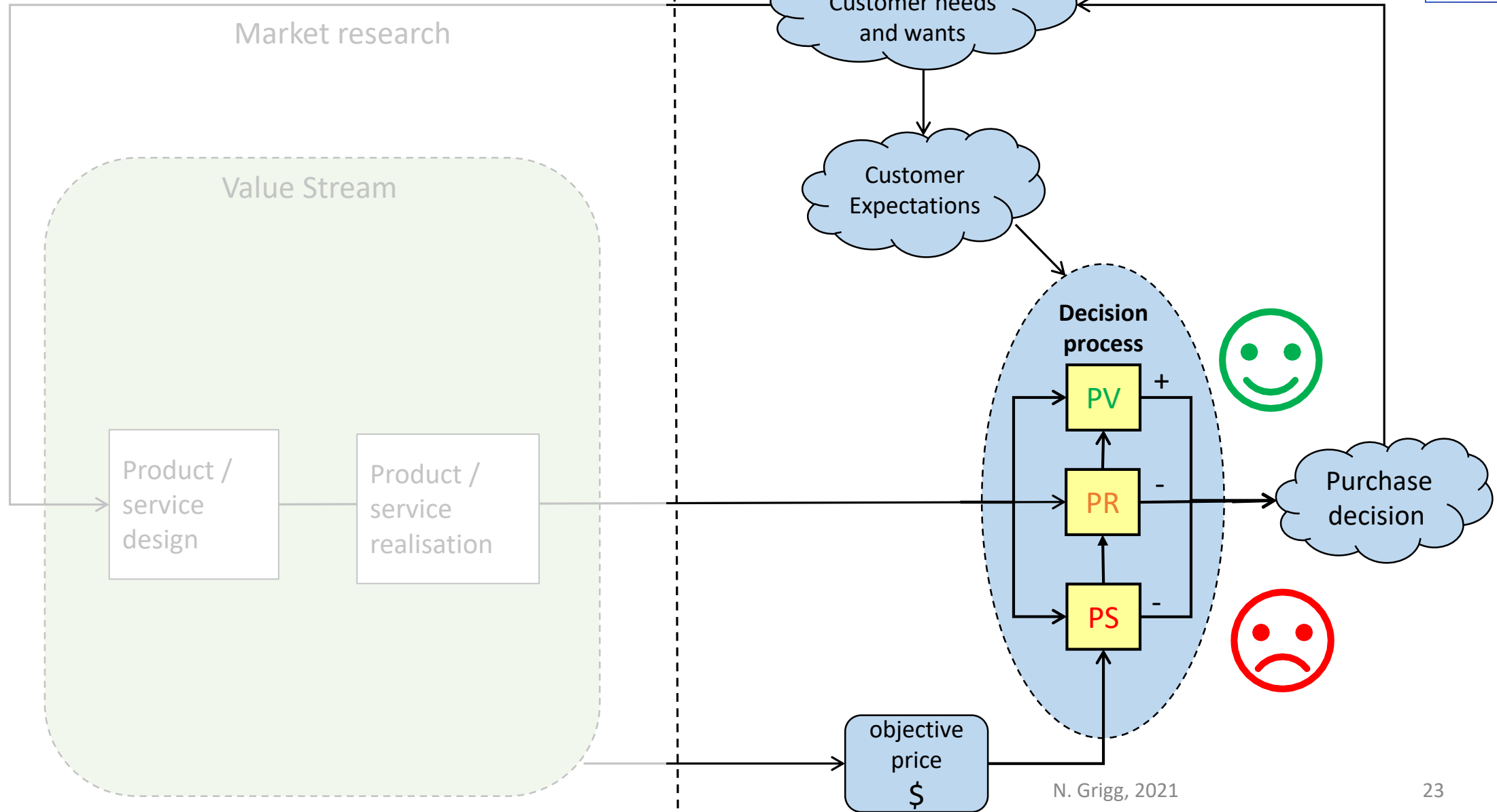


Photo by Damir Spanic on Unsplash



Photo by Mikail Duran on Unsplash

V, R, C	Nature	Relative Rating
Value	<ul style="list-style-type: none"> <li>Pleasurable (at the time) (medium value)</li> <li>A release</li> </ul>	Low - Medium
Risk	<ul style="list-style-type: none"> <li>Detrimental to health and wellbeing</li> <li>Alienating of society, friends and family</li> </ul>	High
Cost	<ul style="list-style-type: none"> <li>Expensive (in the long term)</li> </ul>	High





# QVRC Model – the demand side

There are additional cues, of course. The customer's decision will be influenced by other extrinsic and intrinsic cues

## Intrinsic (product/ service) attributes

### ***For products:***

Performance

Features

Aesthetics

Reliability

Durability

Conformance

Serviceability

Safety

### ***For services:***

Tangibles

Responsiveness

Assurance

Empathy

Service providers

## Extrinsic cues

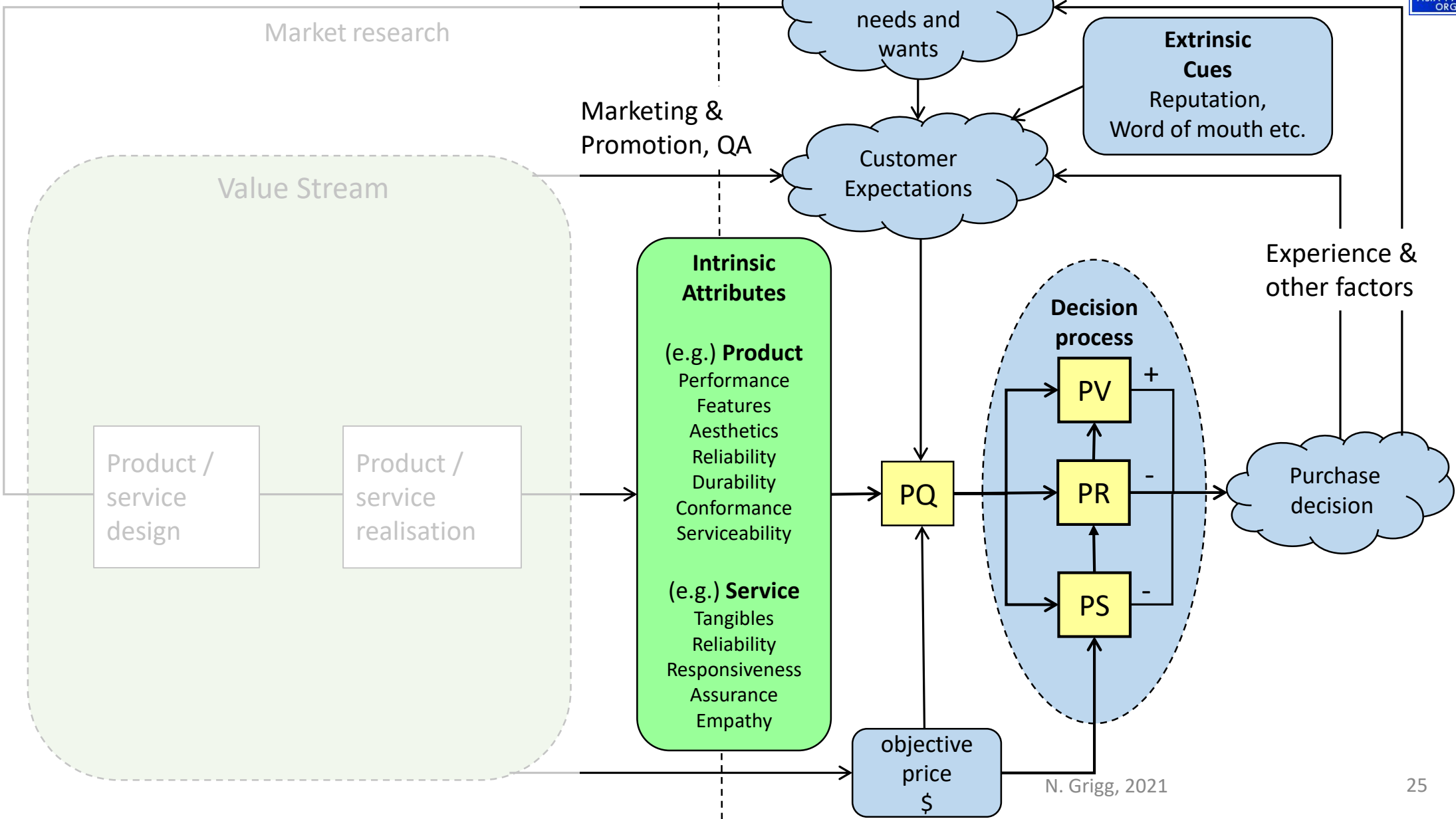
Organisational reputation

Past experience

Word-of-mouth comms

Advertising and promotion

Objective price



# Supply (producer) side

- The value chain needs to ...
  - Understand the customer value, risk and cost balance (market information and research);
  - Deliver the requisite value, risk level and pricing options to meet the market expectations;
  - Manage the process such that the risk and cost are managed to the level that is required under legal and regulatory requirements.



# Managing Cost

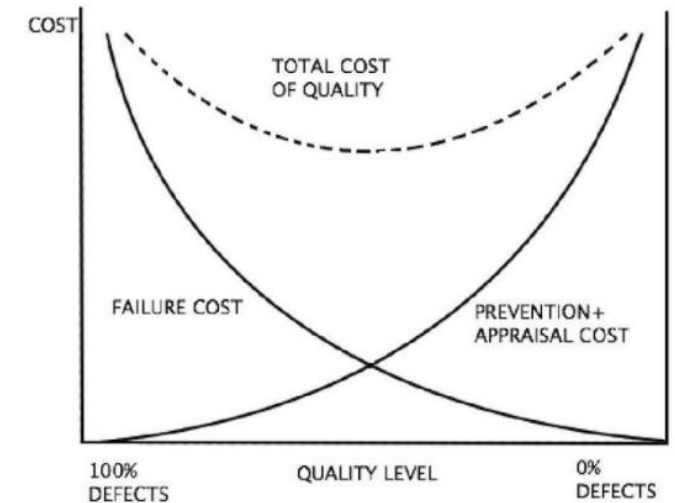
## Economic Quality Control of Manufactured Product<sup>1</sup>

By W. A. SHEWHART

Economic quality control has been a central pillar of quality management since the early 1900s

Notable examples over time:

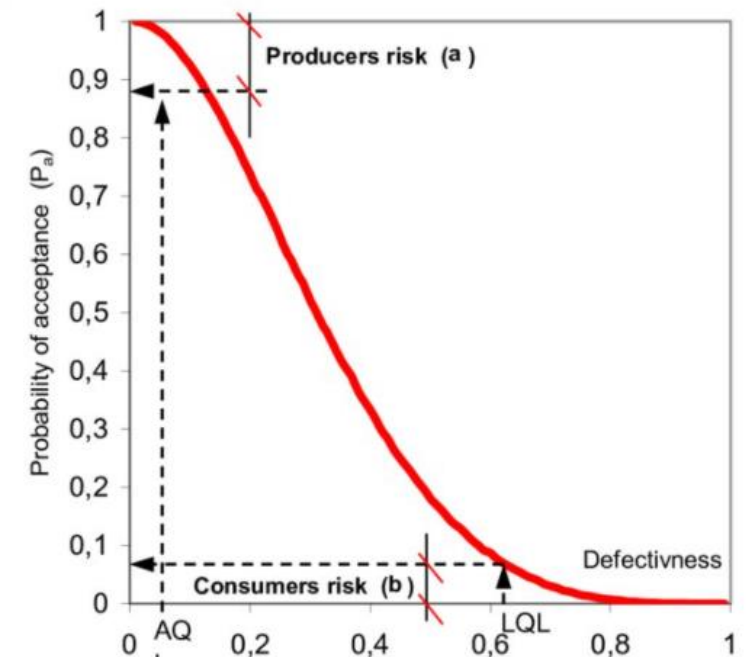
- FORD, H. & CROWTHER, S. 1922. *My Life and Work*, Garden City, N.Y., Doubleday, Page & Co.
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- DEMING, W. E. 1993. *The New Economics* Cambridge, MA., MIT Center for Advanced Engineering Study



Behzad Abbasnejad, *Poor Quality Cost in Construction*: Literature Review, August 2013, ResearchGate, DOI: 10.13140/RG.2.1.2232.1683

# Managing Risk

- Risk was a feature of early acceptance sampling plans (late 1920s), which guarded against consumer's risk and producer's risk.
- A core element of Failure Mode and Effect Analysis (c.1949)  
USDD 1949. MIL-P-1629 – *Procedures for performing a failure mode effect and criticality analysis*. MIL-P-1629. United States Department of Defense.
- Resurgence around the Millennium and after 2008 'Global Financial Crisis'
- Quality Risk Management (QRM) grown in importance along with Supply Chain Risk Management (SRCM);
- Codified into ISO 31000, ISO 9001 and other management system standards.

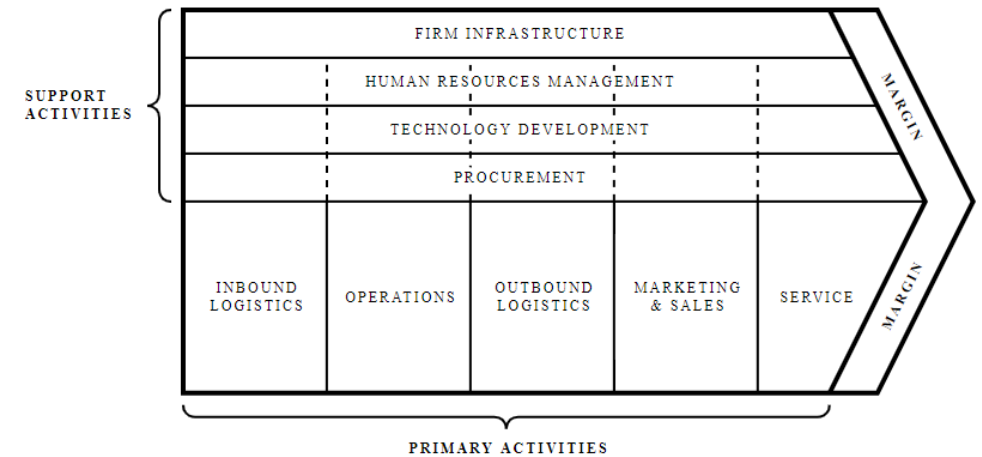


Izabela Skrzypczak, *Concrete production - an application of OC, January 2018, Web of curves in conformity control, Conferences 49(1-2)*: DOI: 10.1051/e3sconf/20184900103

# Managing Value

- Mentioned in relation to quality by David Garvin (value-based view of quality, c.1984).
- Michael Porter brought it to the fore with his Value Chain (c.1985).
- The growth of interest in Lean (itself based on Deming & PDSA) has catapulted the identification, tracking and management of value to the very forefront of process improvement.
- Now concepts of Value Stream and Value Chain co-exist alongside the supply chain.

## Porter's Value Chain



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Wikimedia Commons



# V, R and C can be actively managed throughout the value stream

- **Design** function creates the product or service required (the value), and the system to provide it;
- **Quality Control** reduces unwanted variation in the system, reduces risks and costs and keeps it from becoming chaotic;
- **Quality Assurance** system wraps a system around QC, and provides necessary confidence to value stream partners and customers (lowers perceived risk);
- **Continual Improvement** aims to increase value flow and further reduce waste (sources of risk and cost);
- Methodologies and tools can be categorised in relation to each element.



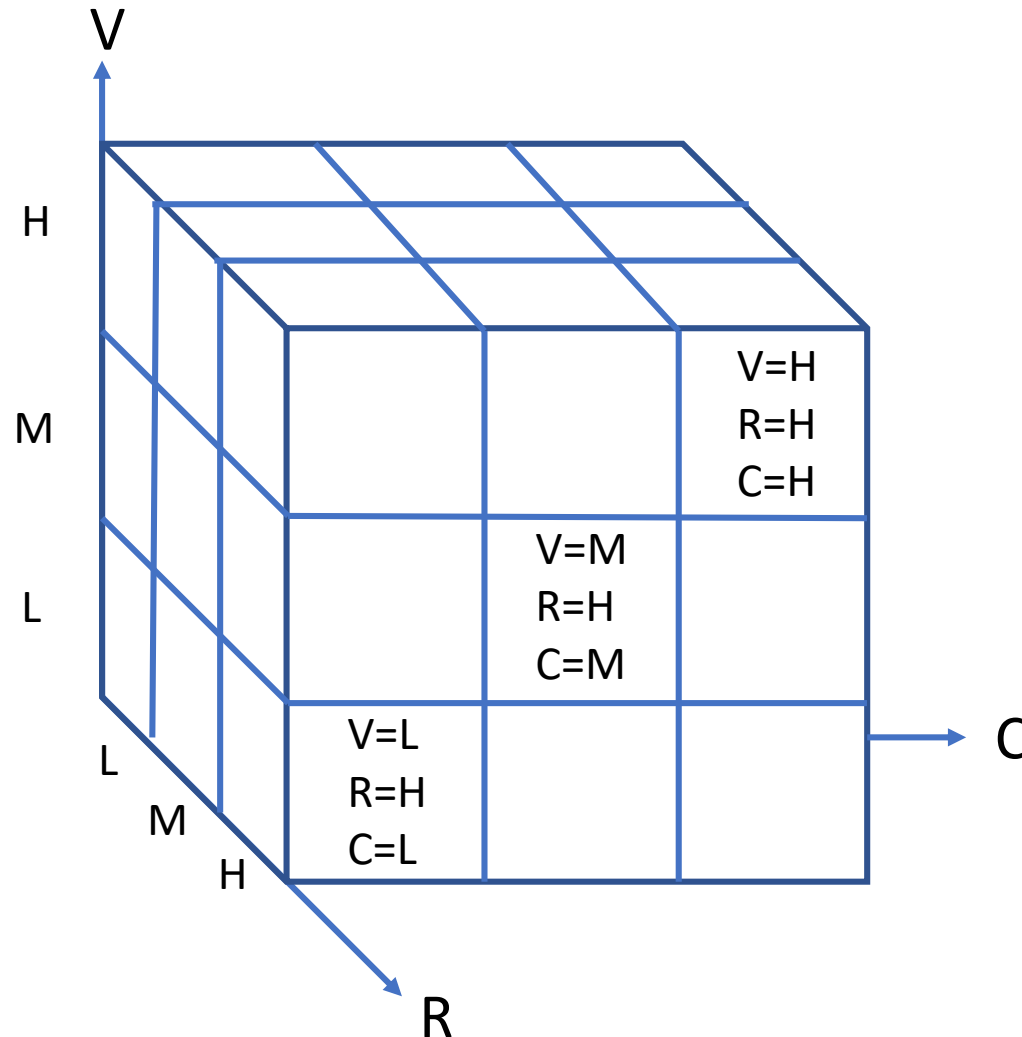


# Visualising three dimensions

## Option 1

### 'The Rubics Cube'

This is OK, but is very hard to render in 2D

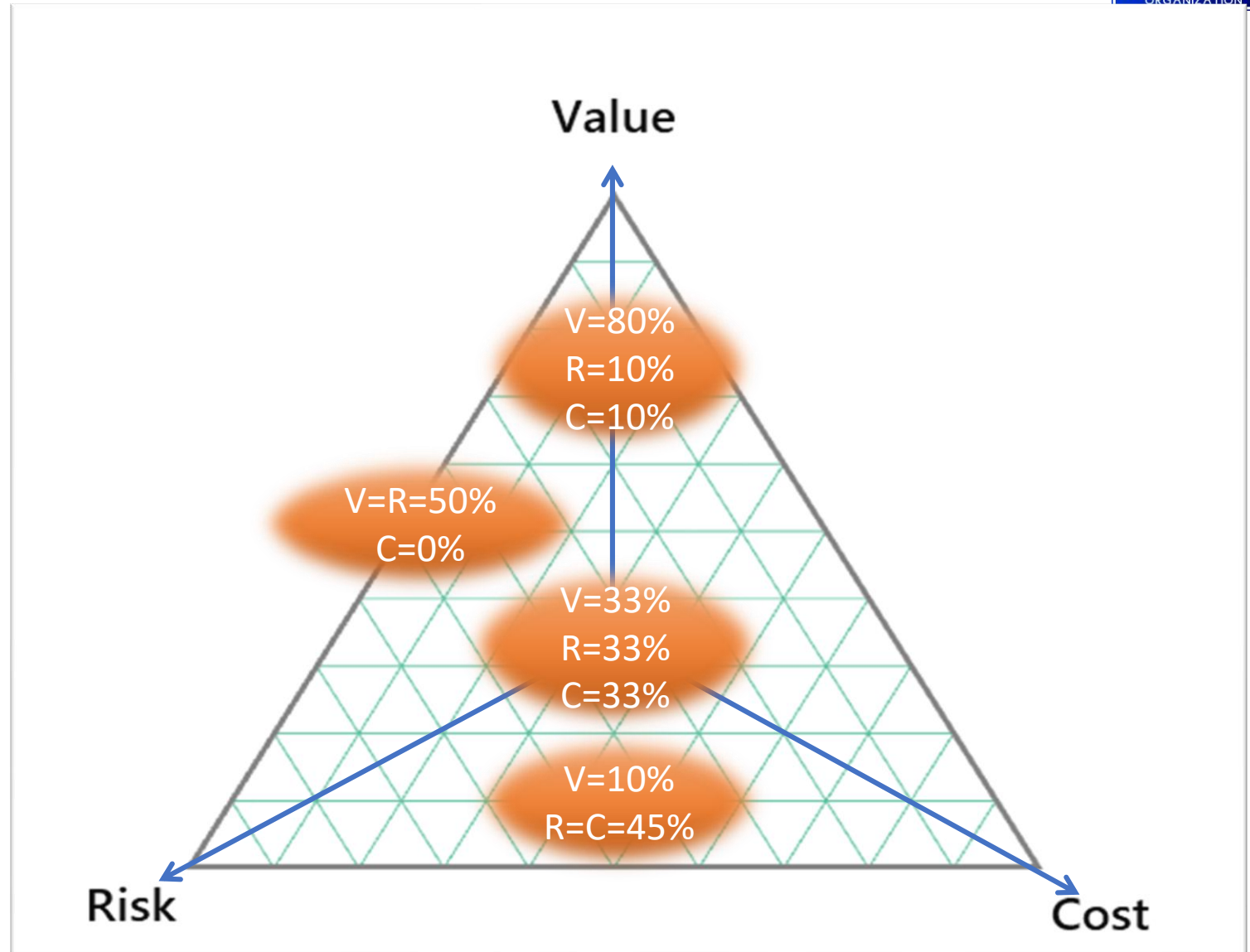
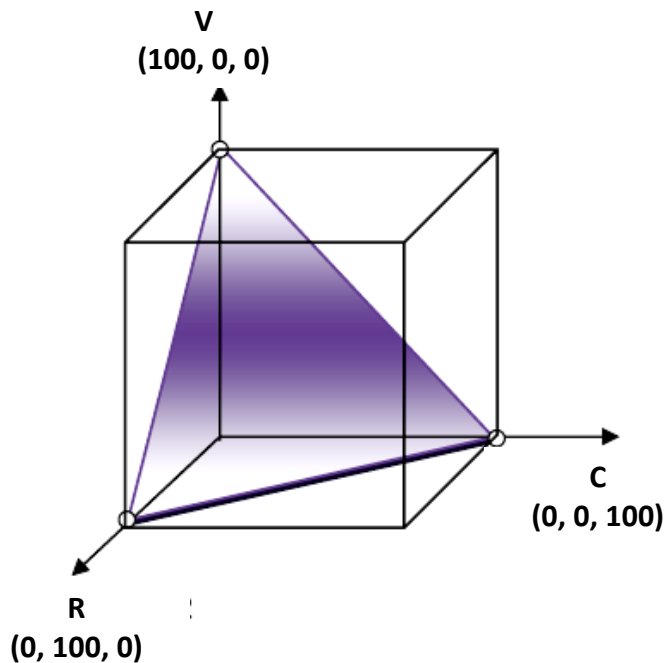




# Representing the three dimensions

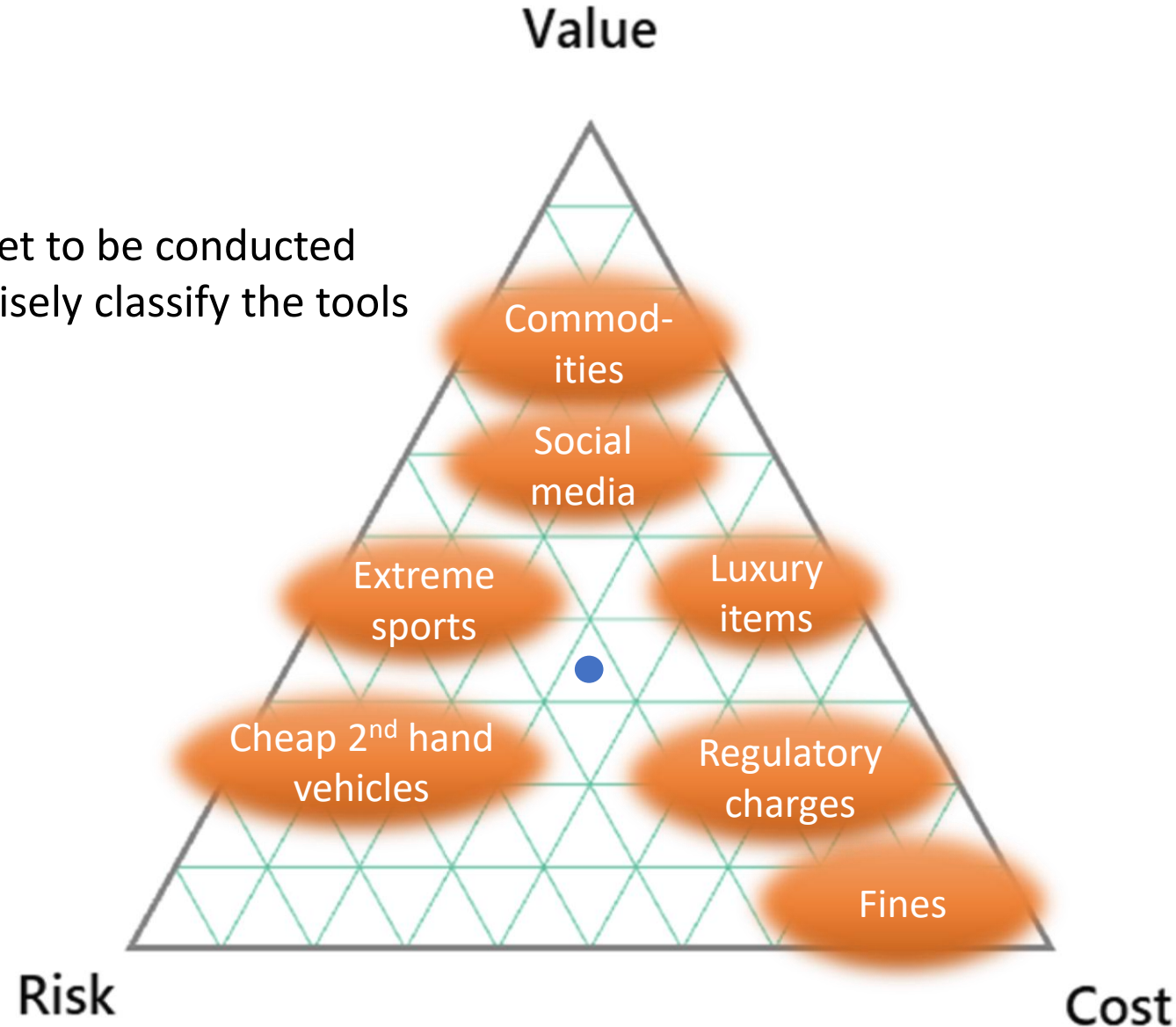
## Option 2 The Triangle Plot

(proportional  
 $V + R + C = 100\%$ )



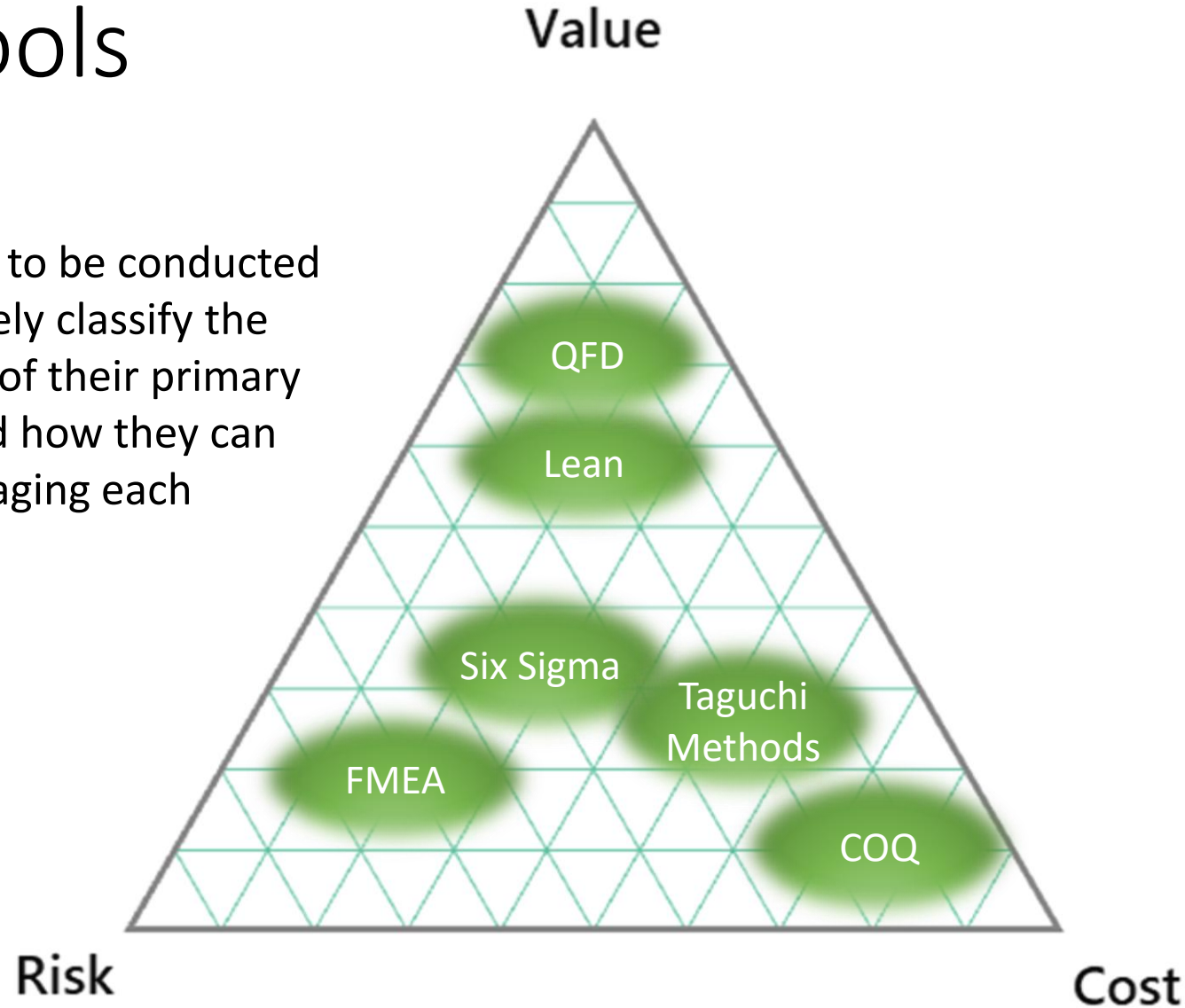
# Classification of products and services

Research is yet to be conducted to more precisely classify the tools

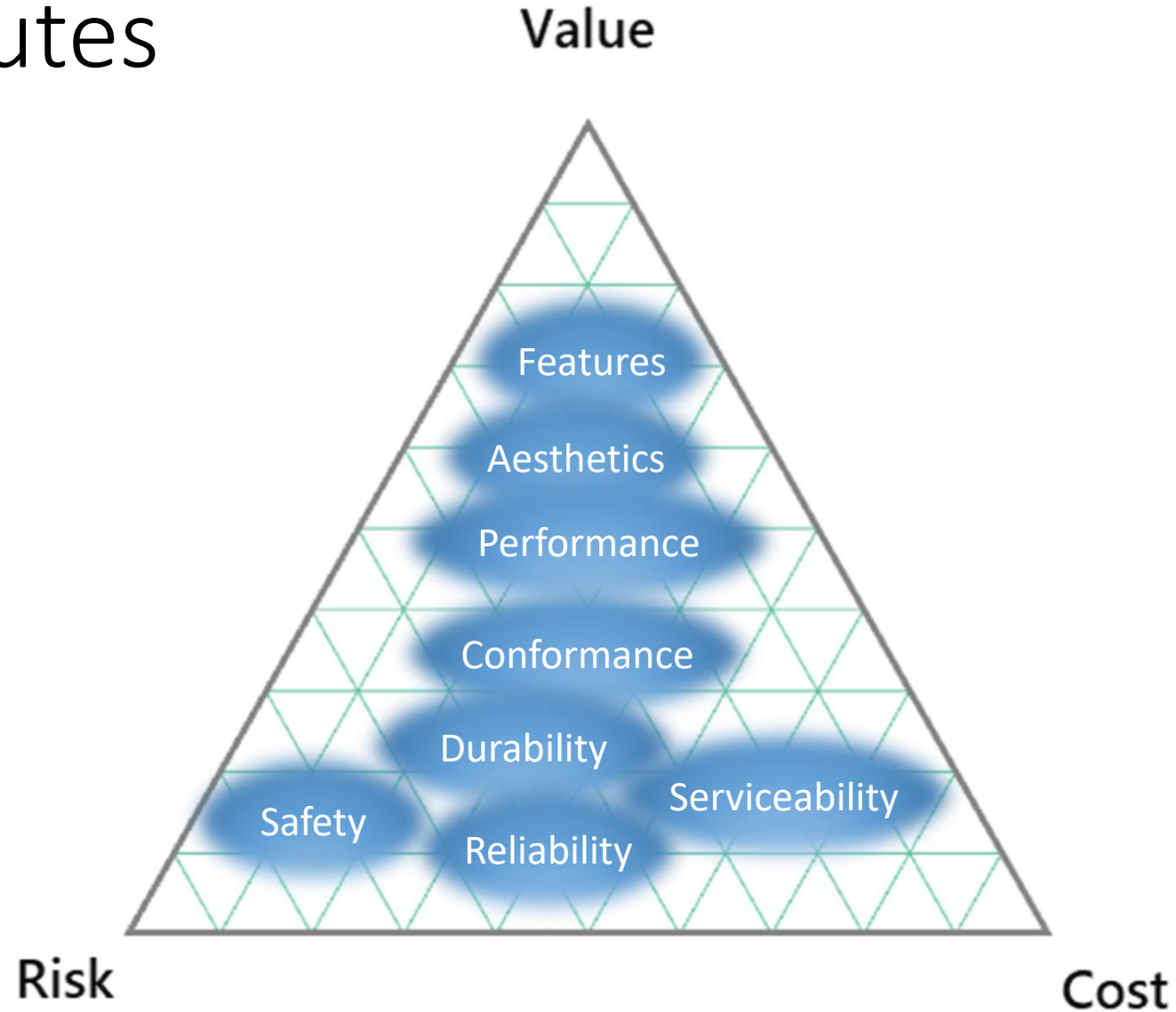


# Classification of quality methodologies and tools

Research is yet to be conducted to more precisely classify the tools, in terms of their primary orientation and how they can help with managing each aspect.



# Classification of product/ service quality attributes





# Next stages

- A series of questionnaires to assess the V, R and C positions of ...
  - Various products & services to establish their respective profiles;
  - The various management methodologies and tools to assess their primary orientation.
- Focused research projects focusing on specific product and service categories (agribusiness, manufacturing, tourism etc.).
- Currently a PhD on Cashmere quality is nearing completion.

# What is the value of this model?

- Knowing the expected V, R and C balance for the product or service in the market, enables the system to be designed to deliver the correct balance;
- Tools can be employed that match the required V, R and C balance;
  - QFD helps deliver value, FMEA helps manage risk, SS reduces variability, Lean emphasises value flow, COQ focuses on cost, and so on.
- Most products and services (and their processes) can be categorised under this scheme;
- Regardless of technological changes, these core elements of quality remain the same, and so...
- The future of Quality is now.

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Thank you to our Qualcon / APQO 2021 sponsors

# Quality in the balance? Competing in the age of black swans and grey rhinos

Grigg, N